



DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

TEMPERATURE AND HUMIDITY CONTROL EQUIPMENT

1. SCOPE

1.1 Scope.- This specification covers the requirements and installation of temperature/humidity control equipment in FAA remote facilities. This includes ventilating and unitary air-conditioning equipment, their respective control systems, and ancillary components of the temperature/humidity control system.

2. APPLICABLE DOCUMENTS

2.1 FAA documents.- The following FAA specification and drawings, of the issues specified in the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

2.1.1 FAA specification

FAA-C-1217

Electrical Work, Interior

2.1.2 FAA drawings.- Applicable drawings will be furnished with the invitation for bids or request for proposals.

FAA-C-2256a

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2.2 Military specification.- The following Military specification of the issue in effect specified in the invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

MIL-C-45662 Calibration System Requirements

2.3 Industry publications.- The following publications, of the issues in effect on the date of invitation for bids or request for proposals, form a part of this specification and are applicable to the extent specified herein.

American National Standards Institute ANSI B9.1	American Standard Safety Code for Mechanical Refrigeration
Air-Conditioning and Refrigeration Institute Standard Nos. 210 and 260	Standard for Unitary Air- Conditioning Equipment
	Standard for Application, Installation and Servicing of Unitary Systems
Air Moving and Conditioning Association Standard No. 210	Standard Test Code for Air Moving Devices
American Society of Heating, Refrigerating and Air-Conditioning Engineers Guide and Data Book	Systems Volume, Equipment Volume, Applications Volume and Handbook of Fundamentals
Association of Home Appliances Manufacturers Publication No. CN-1	Room Air Conditioner
American Society for Testing and Materials (ASTM)	E 84 Method of Test for Surface Burning Characteristics of Building Materials

(Copies of this specification and other applicable FAA documents may be obtained from the Contracting Officer in the Federal Aviation Administration office issuing the invitation for bids or request for proposals. Requests should fully identify material desired, i.e., specification number and dates. Requests should cite the invitation for bids, request for proposals, or the contract involved or other use to be made of the requested material.)

(Single copies of Military specifications may be requested by mail or telephone from U. S. Naval Supply Depot, 5801 Tabor Ave., Philadelphia, Pa. 19120 (for telephone requests call 215-697-3321, 8:00 a.m. to 4:30 p.m. Monday through Friday). Not more than five items may be ordered on a single request; the invitation for bid or contract number should be cited where applicable. Only latest revisions (complete with latest amendments) are available. Request all items by document number. For information on subscription service, direct inquiries to the above address with additional marking ATTN: Code 56, or telephone 215-697-2179, Inquiry Desk.)

(Information on obtaining copies of standards of the American National Standards Institute may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.)

(Information on obtaining copies of standards of the Air-Conditioning and Refrigeration Institute may be obtained from the Air-Conditioning and Refrigeration Institute, 1815 North Fort Myer Drive, Arlington, Virginia 22209.)

(Information on obtaining copies of standards of the Air Moving and Conditioning Association may be obtained from the Air Moving and Conditioning Association, 205 W. Touhy Avenue, Park Ridge, Illinois 60068.)

(Information on obtaining copies of the American Society of Heating, Refrigerating and Air-Conditioning Engineers Guide and Data Book may be obtained from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 East 47th Street, New York, New York 10017.)

(Information on obtaining copies of standards of the American Society for Testing and Materials may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

(Information on obtaining copies of the Association of Home Appliance Manufacturers publication may be obtained from the Association of Home Appliance Manufacturers, 20 North Wacker Drive, Chicago, Illinois 60606.)

3. REQUIREMENTS

3.1 General.- The contractor shall furnish and install the temperature/humidity control system as indicated on the drawings specified in the contract schedule and as described in this specification. In the event of conflict between requirements of the project drawings and specifications and this specification, the former shall take precedence. All materials not specifically indicated as furnished by the Government in the contract schedule shall be furnished by the contractor.

3.1.1 Unitary air conditioner.- As defined in Air-Conditioning and Refrigeration Institute (ARI) Standard 210, a unitary air conditioner consists of one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separated assemblies are to be designed to be used together.

3.2 Unitary air-conditioning equipment.- The unitary air-conditioning equipment shall be furnished and installed as indicated on the drawings. The equipment shall be certified where applicable and rated in accordance with Air-Conditioning and Refrigeration Institute Standard 210. The equipment shall be installed in accordance with the applicable requirements of Air-Conditioning and Refrigeration Institute Standard 260.

The capacity shall not be less than that required on the drawing. When specified on the drawing, the equipment shall be supplied with an electric heating coil of the capacity indicated on the drawing. The air-conditioning system shall be equipped with an outdoor air intake, mixing box, and outdoor and return air dampers with necessary controls. The equipment shall be air-cooled with all elements of the refrigerant circuit properly interconnected with the refrigerant piping. The equipment shall be complete with weatherproof cabinet, air-cooled refrigeration circuit, condensate drain pan, evaporator fan motor and drive, and all other appurtenances required for a complete system. Filters shall be provided with the unit cabinet, or in the ductwork associated with the equipment, as indicated on the drawings and in accordance with ARI 260, arranged to filter all outdoor and return air. The system shall be capable of supplying from zero to 100 per cent outside air to the conditioned space when an outdoor air intake is specified. The system shall be designed, constructed, and assembled in accordance with the applicable requirements of ANSI B9.1.

3.2.1 Cabinet.- All surfaces of the cabinet shall be constructed of corrosion resistant material or material suitably treated to resist corrosion encountered in exterior exposure under normal weather conditions. All interior surfaces of the cabinet through which conditioned air passes shall be insulated with a material having a "k" factor of not greater than 0.25 BTU per (hour)(square foot) (Fahrenheit degree per inch thickness) at a 75°F mean temperature. The air side surfaces of the insulation shall be coated to prevent erosion by the passage of air. Removable panel(s) in the enclosure shall provide easy access to all parts for lubrication, servicing, or removal of components.

3.2.2 Refrigeration compressor.- The refrigeration compressor(s) shall be of the hermetic or semi-hermetic type. Semi-hermetic compressors shall be provided with crankcase heaters and an oil level sight glass. Hermetic compressors without internal anti-slugging protection shall be provided with a crankcase heater. The contractor shall furnish and install charging valves at the compressor-condenser unit(s) on both the refrigerant liquid and suction lines. Charging valves shall be line size on the run with suitable reducing fittings on the branch to facilitate the use of standard 1/4 inch connections for attaching refrigerant gauges. Refrigerant used shall be refrigerant 12 or 22.

3.2.3 Air-cooled condenser.- The air-cooled condenser shall be suitable for either remote installation in a weather protected cabinet or an integral part of the condensing unit fully enclosed within the unit housing as required on the applicable drawings. The air-cooled condenser shall be a complete factory-fabricated and -assembled unit consisting of coils, fans, and electric motor drive. The sizing of the condenser for full capacity at design conditions will be based on a 20 to 25 degree F. temperature difference between the entering outside air

and condensing refrigerant for systems over 60,000 B.T.U. per hour capacity. For systems 60,000 B.T.U. per hour capacity or less, sizing will be based on a 30 degree F. temperature difference between entering outside air and condensing refrigerant. The saturated refrigerant condensing temperatures shall not be over 130 degrees F. The entering dry bulb outside design air temperature will be based on 105 degrees F. When catalog data is not available for the design conditions stated on drawings, the Contractor will furnish a cross-plotting of the Gross Heat Rejection of the condenser against the Gross Heat Rejection of the compressor, for the design conditions; to show the compatibility of the equipment furnished for each complete refrigerant circuit supplied. For those periods when the refrigeration system will operate over design conditions, the equipment shall be capable of operating at 10 degrees F. above stated ambient temperature for a period of 2 hours without damage or shut down of the compressor motor or shut down of the refrigeration system by safety devices. Air-cooled condenser may be used for refrigerant storage in lieu of a separate receiver, provided that the condenser storage capacity is 20 percent in excess of the fully charged system.

3.2.4 Liquid receiver.- The liquid receiver when required by the equipment design shall be complete with shut-off valve, and safety relief device in accordance with Section 13 of ANSI B9.1. Receiver capacity shall be as recommended by the manufacturer, based upon winter operation and system pump-down where applicable.

3.2.5 Refrigeration unit controls.- Controls shall include either magnetic starters with full phase overload protection for electric motors, or contactors for motors having inherent overload protection as well as under voltage protection of compressor motor whether it be single or three phase. Systems utilizing semi-hermetic compressors or hermetic compressors without internal anti-slugging protection shall include pump-down control. Suitable controls for protection of the system against excessively high and low pressures shall be provided. All refrigeration overload controls shall be of the automatic reset type with provision included to prevent rapid motor cycling. Interruption of power to the system shall not require a manual re-set. Controls shall be provided for proper operation of the system without excessive compressor cycling with outdoor air temperatures of 50°F or higher. Low ambient control when required for proper operation of refrigeration cycles of five tons (60,000 Btuh) or greater shall be by means other than fan cycling. Condenser flooding methods of raising the head pressure are the preferred means of low ambient control. Refrigeration cycles of five tons and greater shall be provided with refrigerant control devices other than capillary tubes. Multiple compressor units shall be provided with suitable controls to prevent simultaneous starting of more than one compressor, and with means to manually change the lead compressor in order to equalize operating time.

3.2.6 Filter-drier.- A refrigerant filter-drier shall be installed in the refrigerant liquid line, upstream of and as close as practical to the expansion or solenoid valve.

3.2.6.1 Liquid and moisture indicator.- A liquid and moisture indicator shall be installed between the filter-drier and the expansion or solenoid valve.

3.2.7 Refrigerant piping and charge.- All components of the refrigeration system shall be interconnected at the factory with refrigerant piping (copper tubing). After interconnection, the circuit shall be dehydrated, evacuated, and charged with the operating charge of refrigerant and lubricating oil at the factory. The entire system shall be evacuated to 0.04 inches of mercury absolute (1000 microns). Where more than one factory-made assembly is utilized, e.g., separated evaporator, condenser and compressor assemblies, the refrigerant suction line shall be insulated with 1/2 thick "Fiberglass" O-C flexible tubing, or equal with thermal conductivity not greater than 0.30 Btu/HR/FT²/In/°F.

3.2.8 Fans.- The fans shall be either centrifugal or propeller type as required in 3.2.8.1 or 3.2.8.2. Fans shall be directly connected to the motor shaft or indirectly connected to the motor by a V-belt drive. Belt drives shall be completely enclosed within the unit casing or provided with a guard and adjustable sheaves to provide not less than 20 percent fan-speed adjustment. The sheaves shall be selected to provide the capacity indicated at the approximate midpoint of the adjustment. The fan motor shall be provided with a magnetic starter having thermal overload protection and shall be of the manual or automatic reset type.

3.2.8.1 Evaporator fan.- The evaporator fan for the air conditioning unit shall be of the centrifugal, muliblade type with a capacity not less than that indicated on the drawing and shall be in accordance with paragraph 3.2.8.

3.2.9 Air filters.- Air filters shall be the throw-away type, (not less than) 1 inch thick. Filter face velocity shall not be greater than that recommended by the filter manufacturer for the application.

3.3 Roof mounted unit.- The roof mounted unit shall be equipped with supply and return air duct connections at either the bottom, side, or end of the unit. Supply and return air shall be fed to and returned from a combination supply and return air diffuser mounted in the ceiling or below the roof joists of the conditioned space when specified on the applicable drawing. When a combination diffuser is specified, the return duct shall be located inside the supply duct and the interface shall be insulated. All roof openings shall be flashed and sealed to afford a watertight installation. The unit shall be suitable for rigging into place on the roof either by use of rigging lugs provided with the unit or slings placed underneath the unit.

3.4 Ground mounted unit.- The unit shall be mounted on a concrete slab as shown on the applicable facility drawings.. Where ductwork is required all supply and return duct connections shall be at the side or end of the unit.

3.5 Window and thru-the-wall air conditioners.- Window and thru-the-wall air conditioning units shall be furnished and installed as indicated on the applicable facility drawings. The unit shall be certified and rated in accordance with AHAM Standard CN-1. The unit shall be equipped with supply and return air grilles for free air discharge to the conditioned space. All refrigerant piping shall be interconnected and charged with the proper operating charge of refrigerant and oil. Evaporator and condenser fans shall be connected directly to the drive motor(s). Refrigerant flow shall be controlled by a capillary tube, a thermostatic expansion valve, or an equivalent control device. The cabinet shall be constructed of steel or aluminum and shall be rendered corrosion resistant. The interior of the cabinet shall be insulated to prevent condensation on the exterior surfaces and to reduce sound transmission. The chassis shall be capable of being removed for ease of maintenance. The base pan shall be constructed to prevent moisture from entering the conditioned space. The unit shall be provided with means of draining or otherwise disposing of condensate formed in the evaporator section. All motors shall be protected against overload. A return or room air thermostat shall be furnished to cycle the compressor and condenser fan motor in the unit upon cooling demand.

3.6 Electric heating coil.- The electric heating coil shall be a blast coil heater designed to fit into the unit coil section or ductwork as indicated on the applicable drawing. The heater shall have a built-in, factory-installed pre-set thermal cutout which shall de-energize the heater whenever air flow over the heater ceases. The heater elements shall be spaced to insure that all air passing through the coil or duct section will be heated.

3.7 Ductwork.- Ductwork shall be sheet metal installed as required on the applicable drawings. The ducts shall be securely anchored to prevent vibration under all normal conditions of operation. The internal ends of slip joints shall be installed in the direction of flow, and unless otherwise shown, elbows shall have a centerline radius not less than 1-1/2 times the width of the duct. The sheet metal used shall be non-corrosive. The thickness of the sheet metal and size and spacing of the stiffeners used shall conform to the recommendations detailed in the current edition of the ASHRAE Guide. All ducts 18 inches and larger shall be cross-broken.

3.7.1 Turning vanes.- Turning vanes shall be installed in the ductwork where indicated on the drawings and where the centerline radius specified in paragraph 3.7 cannot be maintained.

3.7.2 Flexible connections.- Flexible connections shall be provided between the ducts and the ventilating unit or the ducts and air conditioning unit. Connections shall be made of unpainted canvas or fireproof fiber cloth without offset between the fan outlet or inlet and rigid duct. Flexible connections shall be securely fastened by zinc-coated iron clinch-type draw bands. Connections shall be approximately 6 inches in width and shall have one-inch slack provided.

3.7.3 Insulation.- All supply and return ductwork for air conditioning units shall be insulated with rigid fibrous glass board with vapor-barrier facing. Insulation shall be installed in accordance with the manufacturer's recommendations for the application and shall be completely weatherproof. The duct sizes called for on the design drawings shall be the finished sizes with insulation. The insulating materials shall have a "k" factor of not greater than 0.25 BTU per (hour) (square foot) (Fahrenheit degree per inch thickness) at a 75° mean temperature.

3.7.4 Fire hazard classification.- All insulating and accoustical materials, vapor barrier, covering and wrapping materials permanently attached or installed separately shall have the following classification. Flame spread rating shall not exceed 25, and smoke developed rating shall not exceed 50, when tested in accordance with ASTM E 84.

3.8 Ventilating unit.- The ventilating unit shall be furnished and installed as indicated on the applicable drawings. The unit shall be a draw-through type complete with weatherproof cabinet, electric heating coil when specified in the applicable drawing, filters, filter mixing box with mixing dampers, fan and motor, magnetic starter, and all other appurtenances required for a complete unit. The cabinet shall be in accordance with paragraph 3.2.1.

3.8.1 Air filters.- Air filters shall be in accordance with 3.2.9.

3.8.2 Unit fan.- Circulating fan for the air handling unit shall be of the centrifugal multiblade type with capacity not less than that indicated on the drawings at the external static pressure indicated. The fan shall be rated in accordance with Standard Test Code 210 of the Air Moving and Conditioning Association. The fan shall be provided with two or more self-aligning and self-oiling or permanently lubricated bearings. V-belt drives shall be designed for varying the fan capacity. Fan and motor requirements shall be in accordance with paragraph 3.2.8.

3.8.3 Return air grilles.- Return air grilles shall be installed as required on the applicable drawings. The grille shall be of the fixed inclined blade design with a net free area of not less than 60 per cent.

3.8.4 Supply grilles.- Supply grilles shall be installed as required on the applicable drawings. The grilles shall be of the double-deflection type with two sets of separately adjustable vanes, one

set horizontal and one set vertical. Net free area of the grilles with all vanes fully open shall be not less than 70 per cent.

3.9 Relief air louver-dampers.- The relief air louver-dampers shall be of the motor-operated or gravity relief, parallel-blade type as required on the applicable drawings. Louver-dampers shall be constructed of galvanized steel or anodized aluminum, equipped with vinyl strips on blade tips and shall close tightly when outdoor air intake dampers of the ventilating or air conditioning system close.

3.10 Fixed weather-proof louvers.- The fixed weather-proof louvers shall be located as required on the applicable drawings. Louvers shall be constructed of galvanized steel or anodized aluminum, weatherproof to a face velocity of 650 feet per minute for both free falling rain and with water, running down a wall, passing over the face of the louver.

3.11 Automatic temperature control system.- The control system shall operate as required on the applicable drawings and shall include all thermostats, wire, conduit or metallic tubing, dampers, and damper motors required to maintain the conditions described and detailed on the drawings. The system shall operate electrically. Control dampers shall be of the proportioning type, with each adjacent blade rotating in the opposite direction. Damper motors shall be of the electrically driven, spring-return type.

3.11.1 Installation of controls.- Control wiring shall be not smaller than No. 18 AWG with 600 volt insulation and installed in rigid conduit or metallic tubing. All control power shall originate on the load side of the heating-ventilating or air conditioning unit as applicable. All control wiring shall be installed in accordance with the applicable requirements of Specification FAA-C-1217.

3.12 Noise level limits.- The noise levels generated shall not exceed the limits shown in the following table with first the air conditioning and then the ventilation system in full operation. All supply and return air grilles shall be in position and properly aligned for air flow. Sound level readings shall be taken at the point of the highest noise level at a distance of five feet from the exterior surface of the equipment with other noise producing equipment in the facility not in operation. Ventilation systems shall be checked in both the zero and 100 per cent outdoor air modes of operation. Calibration shall be in accordance with paragraph 4.1.1. Noise limits are expressed in db with a reference pressure of 0.0002 microbar (dynes per square centimeter).

NOISE CRITERIA - NC 45

Frequency Band (HZ)	20-75	25-150	150-300	300-600	600-1,200	1,200-2,400	2,400-4,800	4,800-10,000
Sound Pressure Level, db	69	62	56	50	47	45	43	42

4. QUALITY ASSURANCE PROVISIONS4.1 Mechanical equipment

4.1.1 General.- All equipment shall be adjusted so that it will perform as specified. The air duct systems shall be adjusted so that the air quantity at the supply outlets is not less than that indicated on the applicable drawings. Air distribution from the outlets shall be free from drafts and uniform over the face of the outlets. Settings of dampers and other volume adjusting devices shall be permanently marked so they can be restored if disturbed at any time. The control system shall be demonstrated to perform all functions outlined in the sequence of operation. Sound level of the mechanical system shall be measured in accordance with the requirements of paragraph 3.12. Calibration of all measuring and test equipment shall be in accordance with MIL-C-45662.

4.1.2 Air conditioning equipment.- The air conditioning unit shall be subject to an operating test of not less than 6 hours to demonstrate satisfactory functional and operating performance. During this operating test, all refrigerant piping and pipe connections within the unit shall be tested for leaks. Leaks found shall be repaired in accordance with the recommendations of the air conditioning unit manufacturer, and a new test run shall be made after completion of the necessary repairs. Inspection and check procedures outlined in ARI Standard 260 shall be performed.

5. PREPARATION FOR DELIVERY5.1 Not applicable6. NOTES

6.1 Note on information items.- The contents of the subparagraphs below are only for the information of the Contracting Officer. They are not contract requirements nor binding on either the Government or the contractor, except to the extent that they may be specified elsewhere in the contract as such. Any reliance placed by the contractor on the information in these subparagraphs is wholly at the contractor's own risk.

6.1.1 Ordering data.- Invitation for bids and contract should specify the following:

- (a) Applicable facility drawings as well as any secondary or reference drawings.
- (b) Items to be Government furnished.
- (c) Type, electrical characteristics and capacity of air conditioning unit where required.
- (d) Electrical characteristics and capacity of the ventilating unit.
- (e) Heating equipment required including heating design temperature.
- (f) Outdoor air intake requirement for air conditioning equipment.

6.1.2 Warranty.- The contractor should obtain a five year factory warranty on the compressor and coils and transfer this warranty to the Government.

6.1.3 Quality control.- Should the project warrant, this specification shall be amended to include all or part of the quality control program requirements set forth in FAA Standard FAA-STD-013.

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